

Applic. No. 10/623,068
Amdt. dated June 7, 2007
Reply to Office action of March 21, 2007

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Claim Amendments

This listing of the claims will replace all prior versions, and listings, of claims in the application:

Claim 1 (withdrawn-currently amended): A method of fabricating filter devices, which comprises the steps of:

providing a carrier wafer carrying a plurality of filters;

providing a capping wafer;

bonding the capping wafer to the carrier wafer, with the filters disposed in cavities between the carrier wafer and the capping wafer; and

separating the bonded wafers into single filter devices, each single filter device having a carrier substrate carrying at least one filter and a capping substrate, and the at least one filter being disposed in at least one cavity between the carrier substrate and the capping substrate, and the ~~at least one~~ the filter devices being coupled to a wiring substrate by at least one interconnection using flip-chip technology, the interconnection being a solder or metal bump.

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Claim 2 (withdrawn): The method according to claim 1, wherein the filters are acoustic wave filters.

Claim 3 (withdrawn): The method according to claim 1, wherein the filters are Surface Acoustic Wave filters.

Claim 4 (withdrawn): The method according to claim 1, wherein the filters are Bulk Acoustic Wave filters, and each Bulk Acoustic Wave filter includes at least one Bulk Acoustic Wave resonator.

Claim 5 (withdrawn): The method according to claim 1, wherein the filters are Stacked Crystal Filters.

Claim 6 (withdrawn): The method according to claim 1, wherein the carrier substrate further includes an integrated circuit.

Claim 7 (withdrawn): The method according to claim 1, wherein the carrier substrate further includes a radio-frequency integrated circuit.

Claim 8 (withdrawn): The method according to claim 1, which further comprises performing the step of bonding the capping wafer to the carrier wafer by using a direct bonding method.

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Claim 9 (withdrawn): The method according to claim 1, which further comprises performing the step of bonding the capping wafer to the carrier wafer by using an anodic bonding method.

Claim 10 (withdrawn): The method according to claim 1, which further comprises performing the step of bonding the capping wafer to the carrier wafer by using an intermediate-layer bonding method.

Claim 11 (withdrawn): The method according to claim 10, which further comprises performing the intermediate-layer bonding method as an AuSi eutectic bonding method.

Claim 12 (withdrawn): The method according to claim 1, which further comprises performing a thinning step for reducing a thickness of at least one of the capping wafer and the carrier wafer, before performing the step of separating the bonded wafers into single filter devices.

Claim 13 (withdrawn): The method according to claim 12, which further comprises performing the thinning step by grinding at least one of the capping wafer and the carrier wafer.

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Claim 14 (withdrawn): The method according to claim 12, which further comprises performing the thinning step by etching at least one of the capping wafer and the carrier wafer.

Claim 15 (withdrawn): The method according to claim 1, which further comprises micromachining at least one of the capping wafer and the carrier wafer to provide space for the cavities.

Claim 16 (withdrawn): The method according to claim 1, which further comprises structuring the capping wafer to provide pad openings.

Claim 17 (withdrawn): The method according to claim 1, which further comprises producing interconnects before performing the step of separating the bonded wafers into single filter devices.

Claim 18 (withdrawn): The method according to claim 17, which further comprises producing the interconnects as solder or metal bumps.

Claim 19 (withdrawn): The method according to claim 1, which further comprises providing passive components on the capping wafer.

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Claim 20 (withdrawn): The method according to claim 1, which further comprises placing additional filters as flip-chips on top of the carrier wafer.

Claim 21 (withdrawn): The method according to claim 20, which further comprises selecting the additional filters as at least one of acoustic wave filters and active/passive ICs.

Claim 22 (currently amended): A filter device, comprising:

a carrier substrate;

at least one filter carried by said carrier substrate;

a capping substrate;

said carrier substrate and said capping substrate defining at least one cavity therebetween containing said at least one filter; and

at least one interconnection configured for coupling ~~said at least one~~ the filter device to a wiring substrate using flip-chip technology, said interconnection being a solder or metal bump.

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Claim 23 (original): The filter device according to claim 22, wherein said at least one filter is an acoustic wave filter.

Claim 24 (original): The filter device according to claim 22, wherein said at least one filter is a Surface Acoustic Wave filter.

Claim 25 (original): The filter device according to claim 22, wherein said at least one filter is a Bulk Acoustic Wave filter including at least one Bulk Acoustic Wave resonator.

Claim 26 (original): The filter device according to claim 22, wherein said at least one filter is a Stacked Crystal Filter.

Claim 27 (original): The filter device according to claim 22, wherein said carrier substrate includes an integrated circuit.

Claim 28 (original): The filter device according to claim 27, wherein said integrated circuit is a radio-frequency integrated circuit.

Claim 29 (original): The filter device according to claim 22, which further comprises at least one contact pad for coupling said at least one filter to a wiring substrate through at least one bonding wire.

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Claims 30 and 31 (cancelled).

Claim 32 (original): The filter device according to claim 22, which further comprises passive components provided on said capping substrate.

Claim 33 (original): The filter device according to claim 22, which further comprises additional filters disposed as flip-chips on top of said carrier substrate within said at least one cavity.

Claim 34 (original): The filter device according to claim 33, wherein said additional filters are at least one of acoustic wave filters and active/passive ICs.